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AUTHOR Northfield, Jeff
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ABSTRACT

In 1989, the Australian state of Victoria introduced a major curriculum reform in postcompulsory education. Curriculum requirements are set out as guidelines to allow schools to vary content and approach while still meeting prescribed work requirements. Assessment responsibilities have shifted from externally set and examined tasks to school-based tasks extending over longer periods of time. In 1989, the author and a team of eight staff members began a 4-year study of the implementation of this postcompulsory curriculum reform. This paper focuses on the implementation of the science study design and outlines the possibilities, problems, and findings from this longitudinal study opportunity. The 4-year study, which has drawn on teacher and student opinions, has allowed a more clear understanding of the complex educational change than would be possible in a shorter study. The longitudinal study allowed the team to see the waxing and waning of problems as innovations, initially regarded with skepticism, became accepted. One disturbing outcome is the clear finding that those responsible for developing and introducing the educational changes actually pay little attention to what is happening at the school level in the implementation process. The study provides a disturbing record of responsible people unwilling to learn, understand, and support curriculum reform. (SLD)

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Researching Curriculum Reform. The Problems and Possibilities or Longitudinal Studies

Jeff Northfield
Faculty of Education
MONASH UNIVERSITY

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Introduction

In 1989, the Australian state of Victoria introduced a major curriculum reform in post compulsory schooling. Similar reviews of post compulsory education had been undertaken across Australian and internationally. The following features seem to be common to all reforms at this level at this time.

* The new curriculum is a response to an increasing proportion of the age cohort staying to complete their secondary education. (In Victoria the proportion of the age cohort staying on to complete twelve years of formal schooling rose from 30% to 80% between 1983 and 1992.)
* The curriculum requirements are set out in the form of guidelines which allow schools to vary content and approach while still meeting prescribed work requirements and assessment demands.
* Assessment responsibilities have shifted from externally set, conducted and examined tasks to school-based tasks extending over longer periods of time. This has lead to an increase in the validity of assessment, but a concern for problems of subjectivity and the reliability of assessment and an increasing workload for teachers who have to carry out various parts of the assessment task.

In Victoria, the structure of the Victorian Certificate of Education (VCE) required a two year, four semester (x six units) commitment in Years 11 and 12 of schooling. This replaced a one year, six subject program to conclude secondary education. The range of science related study designs developed included four semester sequences in Physics, Chemistry, Biology, Science, Psychology, Earth Science as well as related programs in Technology Studies, with all students having to include at least four semester units of Science/Mathematics in their 24 unit program over the two years.

In 1989, the author and a team of eight staff began a four year study of the implementation of this post compulsory curriculum reform. This paper focuses on the implementation of the science study designs and outlines the possibilities, problems and findings which emerged from this rare longitudinal study opportunity.

The purposes for the study

Table 1 sets out a range of purposes for evaluation research, and this study was initially developed with purposes 6 and 7 in mind (ie. a focus on the general question "What is happening in schools?" rather than "How well is the VCE working?").

Table 1

Range of purposes for evaluation

1	To establish whether objectives have been achieved
2	To assist making decisions about teaching materials and approaches
3	To justify continuation of a program
4	To revise the teaching/learning approach
5	To assist making decisions about students
6	To describe the program to a wider community
7	To understand what it happening (Research)
8	To enhance the professional development of teachers

However one of the outcomes of the longitudinal study and a continuing relationship with the communities in 15 schools, was the increasing emphasis on purpose number 8 in Table 1. By the third and fourth years it became clear that involvement with the project team was being seen as an opportunity for schools to check their ideas and gain new ideas from other schools. The requirement to explain their VCE implementation to members of the team was seen as a valuable professional development activity by many teachers. Each of the four annual evaluation reports also allowed the school place their concerns and progress alongside developments in other schools.

From the outset, the decision was taken to involve a team of people in the evaluation. This decision allowed for a more intensive study of a larger number of schools. As far as possible the same team members have maintained contact with each school over the four year period. This has lead to a deep understanding of each school and the way it has responded to the challenges of the reform.

While a team of people allows for more intensive coverage of schools and the input of a wider diversity of views, there were problems developing a sufficient consensus for each report. In preparing each of the four reports it was necessary to interview each team member about the important issues emerging from the schools. Together, this series of interviews lead to a series of statements which had some claim for inclusion in the report. These statements, when further discussed, formed the core of each report. Drafts of each of the four reports were returned to each of the schools in the study, for reaction and correction, before being released.

The findings from the four year study will be outlined with particular attention paid to developments in the science curriculum areas.

Accepting the new curriculum demands

The first report (Northfield et.al, 1989) highlights the scepticism with which new teaching, learning and assessment approaches were received by members of the school community. The guidelines and assessment approaches encouraged independent and active learning, with research projects, oral communication and problem solving tasks included as part of each students' final grade. Despite widespread satisfaction with the new requirements, students and teachers were aware that these activities and assessment procedures were not what had been undertaken and valued in their prior schooling experience. Interpreting one student's response, the first report describes the situation in this way:

> *"David [the student] acknowledges satisfaction with his efforts and identifies the skills he needed to satisfy the work requirements. Yet he does not appear to value what he has done. For David the learning that is valued is related to input of new information, the compiling of notes and subsequent assessment based on this new information.*
>
> *One teacher explained the issue in terms of the past school experiences of the students.*
>
> *'Kids want to be taught, they don't want to think. This is what has generally happened to them in school anyway and if they are successful in school it is because they have been taught - they have never got much credit for thinking ....'.*
>
> *In many cases when it was clear that these skills [problem solving, interviewing, presentation of ideas, etc.] were being achieved a student did not recognise or value them and often expressed concern that time had been taken away from what they perceived as 'real' learning (ie. exposure to formally presented content). This view was reinforced by some parents and teachers. At least one implication is that successful achievement of the objectives may not be perceived as successful outcomes at the school level.*
>
> (Northfield et.al, 1989, p.10)

This type of response was further underlined by suggestions that the new reform would lower standards and may not be acceptable for entry to tertiary institutions. Activities, which differed from what was traditionally valued at the end of secondary education, were being experienced in a guarded way as schools waited for signs of wider acceptance. The value of a longitudinal study became evident when, in the following years, this major issue of school level acceptance decreased significantly in importance for teachers and students.

Implementing the reform - adding new to the old or rethinking the task

The second and third reports include teacher descriptions of their first experiences in implementing the new courses. A group of Chemistry teachers described their approaches to the new course in ways that illustrated two types of response. There were teachers who continued to teach *"the basic concepts of Chemistry"* and then added the VCE requirements. This "adding the new to the old" meant that these teachers were under time pressures and the components of the course, including "the basic concepts" were covered superficially. The second type of response became more common over time. These teachers realised that the approach to Chemistry had been fundamentally altered and traditional content had been replaced by new ways of achieving often different learning outcomes.

Teacher reaction to the first two semester units in Chemistry reflected a need to accommodate a major change in approach. The first unit focussed on everyday materials and their properties and structures. For some teachers this was *"interesting but not real Chemistry"*. The second unit was identified as containing more traditional Chemistry materials and concepts and was more readily accepted by teachers.

These responses of Chemistry teachers were typical of teachers across all disciplines. The longitudinal study allowed a clearer understanding of the way teachers come to terms with a major curriculum reform, especially when its introduction was associated with minimal inservice education.

Broader assessment approaches not widely accepted

The desire to assess a wider variety of skills and outcomes than can be assessed in external exams lead to the introduction of a range of assessment tasks. These tasks are presented to students throughout each semester unit. Many (eg. research project, problem solving tasks) are completed over extended periods of time in the school setting and assessed by teachers following clear criteria. Teacher grades are then verified by appointed teachers in an attempt to maintain statewide grading standards. The broadening of assessment approaches inevitably shifted greater responsibility to teachers at the school level, but it is interesting to consider how much central control remains. The verified assessment tasks are centrally set and completed in each school in defined time frames. The criteria and control of verification remains outside the school and therefore the professional judgement of teachers is limited. In fact, the verified assessment tasks have been established in a way that

has opened up assessment to greater scrutiny than ever before. The longitudinal study has allowed the controversial issues of authentication (How do we know it is the students work?) and verification (Is the result fair and accurate?) to be followed and better understood over the four year period.

The school assessed and verified assessments have been widely portrayed as unreliable and open to cheating. This reveals a lack of faith in the profession and teachers ability to complete assessment responsibilities despite at least two strong reasons for having confidence in teachers. Firstly, studies have shown that the reliability of teachers verified assessments is better than the reliability of marking of open-ended responses in external examinations. Secondly, many of the teachers who are engaged in the verified assessment processes are also engaged in marking the external examination components of the VCE course and would be increasingly used if the external proportion of the total assessment is increased.

The increased validity of providing a greater range of assessment approaches is not as widely accepted as the perception that greater teacher involvement may lead to increased unfairness in the assessment system. The external examination system remains unchallenged and is seen as being fairer and more reliable. Future changes are likely to see teacher assessment statistically adjusted against external results, an indication that the community finds it difficult to accept increased teacher involvement, even if the assessment process is more valid.

Changing learning outcomes

Over the four years of the study, teachers have commented on, and shown examples of, students work. The quality of the work, and differences from previous efforts at this level, have been the focus of particular comments from teachers. There is evidence that the emphasis on independent learning, research, problem solving and communication skills has lead to shifts in learning outcomes. In the final report attention is drawn to the fact that girls were out-performing boys in achieving higher grades on the verified assessment tasks. This was particularly evident in the science areas (See Figure 1 for an example of the grade profile for an assessment task in Physics). It appears that the socialisation processes have meant that girls are better able to cope with the demands of tasks which require organisation and planning, persistence and written communication skills.

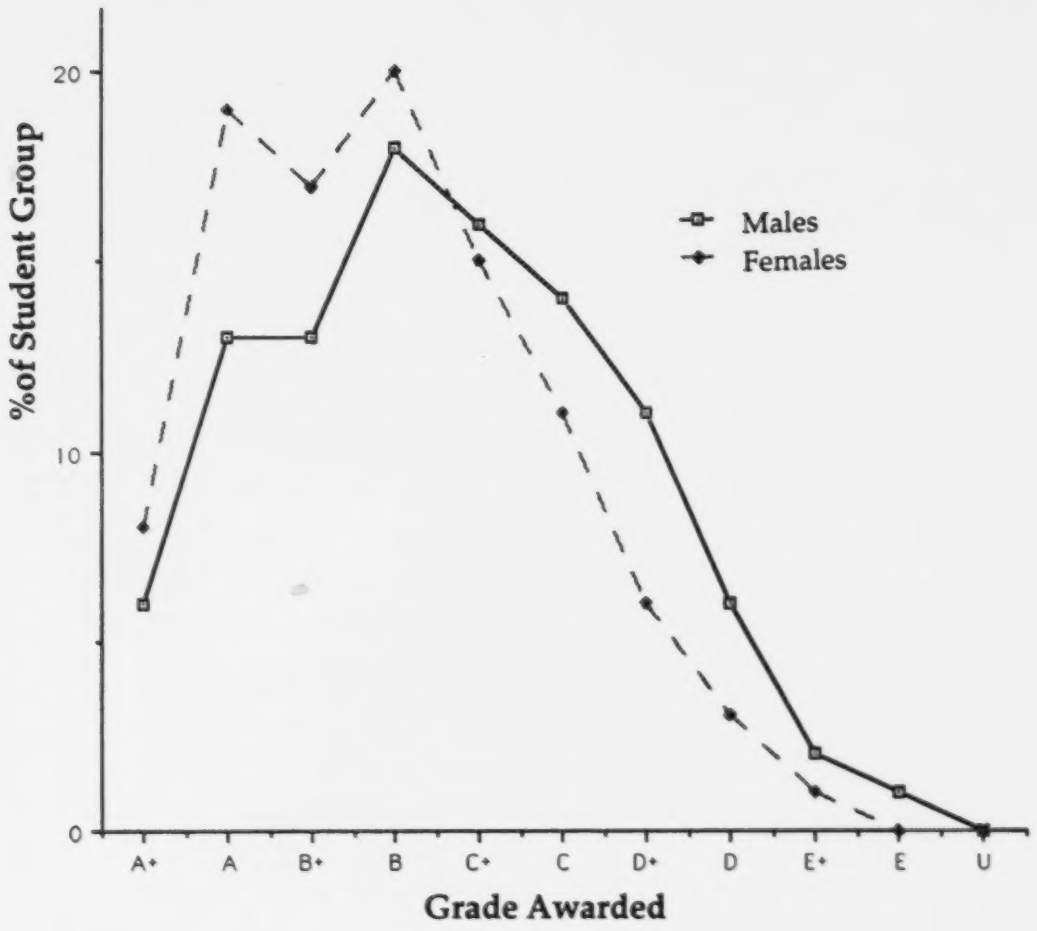

Figure 1. **Grade profile for boys and girls in the first verified assessment task in Physics**

Further continuation of the longitudinal study would allow us to see whether the advantage for girls is a short term phenomenon which will disappear as it becomes clear that a wider range of skills are being promoted and valued in the assessment process. Over the four year period it has been interesting to note that these outcomes which were viewed with scepticism (See *Accepting the new curriculum demands* on p.3) are now a widely accepted part of the curriculum reform. The continuing debate, and doubts expressed about school level assessment (see previous section), remains a threat to the continued development of broader assessment approaches. The new types of learning outcomes will only continue if the assessment procedures to allow students to gain value for their efforts in these areas.

Issues specific to the science disciplines

The development of the science courses in the VCE have been shaped by a number of factors. The increasing proportion of the age cohort staying on the complete 12 years of formal schooling has meant a "science for all" perspective has been necessary. At this level, Technology Studies and Psychology have rapidly increasing enrolments and now broaden the range of study with the traditional Physics, Chemistry, Biology, Earth Science and Science courses. Within each area of study there has been a need to cater for students with a wider range of skills, abilities and interests.

A more constructivist teaching/learning perspective has gathered strength in research and practice (Ministry of Education, 1987; White, 1988; Baird and Mitchell, 1988; White and Gunstone, 1986) and these ideas became incorporated into the curriculum documents of the VCE. This is reflected in a shift from a "show and tell" approach to attempts to provide first hand experience and provide links to everyday experiences. Two areas of concern have emerged as a result of this shift in emphasis. In the first two evaluation reports there was a concern about the requirements for site visits in almost all of the science studies. The difficulty of finding time in the timetable and organising relevant visits was associated with anxiety that many sites would be reluctant and/or unable to respond to the demands. Over the four years these concerns have abated to a large extent. Costs and time available remain, but negotiations between schools and industry and community sites have resulted in some very positive outcomes.

A second area of concern relates to the shift in emphasis on providing relevant experiences being equated to a lowering of standards. There is a view that students do not know "important" concepts, and the increase in research and independent learning and communications skills is not seem as compensating for such deficiencies. In some ways this is an example of sections of each generation perceiving that the new generation is less competent and not accepting that there are differences in learning expectations and values. In the case of the VCE there is a lack of confidence (and understanding of) the ideas about learning that underpin these curriculum changes. The four year study has therefore documented a contestation between the education ideas which have shaped the VCE, and more traditional views and values expressed in some sectors of tertiary education, the community and the media. In Victoria, this "debate" became polarised along political lines and the educational issues became blurred in election policies and promises.

Reflecting on the longitudinal features of the study

The four year study has allowed a clearer understanding of a complex educational change than is possible in the more "snapshot" nature of shorter term evaluation studies. In the first report the team comment on their surprise at the widespread acceptance of the VCE among science teachers. Before our first visit the media had given an impression of a disaster being introduced into schools. There were problems, and the longitudinal study enabled the team to plot the "waxing and waning" of issues and the way they were resolved at the school level. Many issues needed interventions and modifications to the VCE. In other cases, issues had to be resolved at the school level and support and exchange of ideas and experiences became important for schools. The longitudinal study was a way of monitoring issues and learning from schools.

One disturbing outcome of the study is the clear finding that those responsible for developing and introducing educational changes pay little heed to what is happening at the school level in the implementation process. Those responsible for improving education and learning outcomes seem incapable of becoming learners themselves. Our education leaders (and politicians) seem to require certainty and have a desire to establish predetermined curricula in schools in a top down fashion. The study provides a disturbing record of responsible people unwilling to understand, learn, revise and adequately support an important curriculum reform. The result was an ambitious change which had to be shaped, tested and understood in the school situation. Yet this adjustment process was often perceived as an indication of failure of the reform. Politicians and policy-makers may feel they have "got it right" but the final shape of a major curriculum can only be seen at the school level.

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